

Creation of the Marine Resource Center at MBL

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“Study nature, not books” Louis Agassiz

Marine Biological Laboratory (MBL)

In 1986 I received an offer to be President and Director of the Marine Biological Laboratory in Woods Hole. This was a very attractive offer as not only did we have many friends there but also this challenge extended my responsibility beyond biomedical science to general biology and marine biosciences. MBL is the oldest marine biological lab in the U.S. and played an historic role in biological research and training in this country. In February 1987 I accepted Director and Presidency of the MBL. I took over immediately as President but delayed taking over as Director until September to wind up matters at Brandeis. I was very pleased that Ray Epstein accepted the position of Assistant Director.

Early history

Serious study of marine organisms did not start until the creation of marine laboratories. The oldest marine station in the world, Station Biologique de Roscoff was established in Concarneau, France by the College of France in 1859. Concarneau is located on the northwest coast of France. The station was originally established for the cultivation of marine species, such as Dover sole, because of its location near marine estuaries with a variety of marine life. In the next half-century marine laboratories were formed throughout the world, including the Marine Biological Laboratory in Woods Hole, Massachusetts in 1888.

Three motivations drove the activities of the emerging marine stations: 1) to understand the nature of the biota in the marine environment, 2) to insure a supply of food for the world's population, and later 3) to provide marine models for biomedical research.

Driven by economic concerns, in 1871 Congress created the US Commission of Fish and Fisheries (now known as the National Marine Fisheries Service), to investigate and make recommendations concerning the declining fish stocks. Congress appointed as Commissioner of Fisheries Spencer Fullerton Baird, who began a collection station in Woods Hole, Massachusetts, because of the abundant marine life there, and to investigate declining fish stocks. This laboratory still exists now known as the Northeast Fisheries Science Center, and is the oldest fisheries research facility in the world. Nonetheless, Spenser Baird stated in the first report of the Commissioner of Fish and Fisheries for 1871 that the causes of the problems encountered might include:

- 1) Decrease or disappearance of the food of commercial fishes,
- 2) migration of fishes to other localities,

- 3) epidemic diseases and "peculiar atmospheric agencies such as heat, cold, etc.",
- 4) destruction by other fishes,
- 5) man's activities resulting in the pollution of water, in over fishing, and the use of improper apparatus. With a few changes in words and emphasis, that statement is probably as valid today as it was then.

The genesis and the early history of marine animals at the Woods Hole from 1888 to 1944 were summarized by Frank R. Lillie in his book "The Woods Hole Marine Biological laboratory." Work at the National Marine Fisheries Service, to a lesser extent the Marine Biological Laboratory (MBL), and to some degree the Woods Hole Oceanographic Institution (WHOI), were elegantly covered by Paul S. Galtsoff (1962) in his BCF Circular "The Story of the Bureau of Commercial Fisheries Biological Laboratory, Woods Hole, Massachusetts." His book covers the period from the beginning in 1871 to 1958.

Supply Department at the MBL

The first person hired to collect marine animals was George Grey in 1909. To supply animals for the research and educational programs at the MBL, a wooden Supply Department building was constructed in 1924. Grey served as its Director until 1935, when he was replaced by James McInnis. By August 8, 1939 Dr. Irving Charnus, Chair Supply Dept. Committee recommended replacement of Supply Dept. Building. The building was thought to be inadequate. Drawings were made for a replacement, but the structure was never built. During the next 50 years, efforts to rebuild the Supply Department building were intertwined with efforts to build a year-round research program. Given the governance of the MBL, controlled by a board of Trustees drawn from a corporation almost exclusively populated by summer scientists, efforts to build a year-round research program were controversial. Nevertheless Director Dr. P.B. Armstrong recognized in the 1950's need for increased year-round science when he built the Whitman Building. In 1993 when James McInnis retired, John Valois was recruited as his replacement. After 1954 hurricane, the Supply Department building was renovated significantly in 1955. The next Director Dr. H.B. Steinbach recommended more year-round use of facilities when in the 1960's he built the Loeb Teaching Laboratories and the Swope Dining and Housing building.

Beginning in the 1970's efforts to address the need for a new facility for marine animals began in earnest. In 1970 through 1971 the Trustees approved a Year-Round Resource Center for Research based upon recommendations from Long-Range Planning Committee during the Directorship of Jim Ebert. The Executive Committee and Trustees approved (5/2/70) a proposal to NSF, Sloan, and Spencer Foundations, which include a development of a Resource Center in Marine Biology. A few years later (1974) the Decennial Committee endorsed increasing year-round science.

Finally in 1975 through 1976 a Committee on Marine Resources under Director Keith Porter, prepared core grant to NIH for construction of 36,000 sq. ft. facility. The Boston firm of Pierce, Pierce and Kramer carried out a preliminary study. In October 1975

Porter creates an *ad hoc* planning committee for MRC and reports that the Executive Committee has assigned a “sum of money” for preliminary planning. Architects presented in February 1976 the results of their feasibility study to Board of Trustees (which included the building design, site plan, and model of the proposed building). On November 19, 1977 the new Director James Ebert submitted the proposal for MRC for \$3.5 M to Dana Foundation (it was refused) and \$100,000 for equipment to the Surdna Foundation (he received \$50,000).

By 1979 the MBL Space Program Planning was approved by Trustees during the Directorship of Paul Gross. The Second Century Fund Campaign started that year, included MRC. Plans were developed in May 1980 for a combined Marine Resources Center and Research Center. Paul Gross brought both the Aquavet and Mariculture groups into the planning process. This new program would have at least one year-around veterinarian at the MBL. ” Gross inquired about support from the Director of Research Resources at NIH. The response was negative. Nevertheless in February 1982 Gross requests \$132,500 from NSF to improve MRC and received \$80,000 but the grant excluded costs associated with planning or the Center.

Undaunted, in August, 1982 Paul Gross received \$75,000 from Dana Foundation for reactivating planning for the Center. Proposals for feasibility studies were requested in January 1983. On Feb. 16, 1983 Paul Gross proposed a feasibility study for funding Marine Resource Center. With the support of the Charles A. Dana Foundation, a more detailed feasibility study as carried out by Skidmore, Owings and Merrill. In a letter to Trustees, Paul Gross said: “The experience of my predecessors in this office, and my conversations with Foundation and granting-agency officers, led to a strong conclusion: the MBL cannot hope to raise money for a new structure, such as was proposed in the middle 1970”s, solely as replacement of the Supply Department facilities..... Potential donors will ask for a ‘program’ to justify the MRC.” On September 20, 1984 Paul Gross proposes Marine Resource Center. The 1984 Decennial Committee supports his recommendations.

Additional support came from several sources. On July 25, 1985 a meeting of the MBL Marine Resources Committee, Chair Sears Crowell reports on concerns raised over release of exotic species into the Eel Pond. The committee asked what is other labs doing, it was pointed out that at WHOI, discharged water from ESL is chlorinated. However the committee took no action at that time. Finally on October 29, 1986 the Exotic Animal Regulations were established at MBL. Shipping water was to be sterilized by clorax treatment. Animal received were to be kept in quarantine. Tanks were to have filters at the discharge side. Exotic species were to be examined for potential hazards. It was difficult to do more than this with the aging Supply Department building.

Paul Gross convened on May 1986 the Committee on long term Laboratory goals. Their instructions were to recommend the Direction MBL should take in next 10 years. Chaired by Gerald Fishbach this committee met during the spring and summer of 1986.

On Sept. 17, 1986 a small animal facility, designed by Goody, Clancy & associates, Inc.

Architects Boston, was reviewed. On January 9, 1987 Richard Cutler's analysis showed that cost of urgently needed renovations for the Supply Department Building is enormous. Finally on February 14, 1987 the Trustees approved, in principle, the Long-Range Goals, including a new year-round research building to house 4 new clusters of science and a facility for warm-blooded animals and marine animals recommended by the Fischbach Report.

On July 13, 1987 Louis Leibovitz, Director of laboratory for Marine Animal Health, points out that the present facilities are inadequate in meeting current standards for the maintenance or production of laboratory animals. "Currently greater than 250 different species of marine and aquatic organisms are employed as experimental subjects at the MBL. The creation of new marine animal models for scientific investigation has created demands that exceed their natural abundance."

In September 1989 Dr. Donald Abt, University of Penn., became Director of the Laboratory for Aquatic Animal Medicine and Pathology (LAAAMP, renamed from LMAH), supported through the Robert R. Marshak Term Professorship of Aquatic Animal Health Medicine and Pathology.

In 1990 John Valois retired and Edward Enos was promoted as his replacement.

A Review of MBL Plans for the Future

For the first half century of its existence, the MBL was essentially a summer marine laboratory. After World War II it became increasingly evident that the summer program was insufficient to support the maintenance of the MBL. Directors turned to encouraging year-round research programs to stabilize the financial structure of the laboratory. The origins of the MRC are linked to this history.

During the 1950's, MBL Director Dr. P.B. Armstrong recognized need for Increased year-round science and promoted the construction of the Whitman building. The following Director, Dr. H.B. Steinbach recommended more year-round use of facilities and promoted the construction of the Loeb Teaching Laboratory and the year-round dining and housing Swope Building.

In 1970-1 the MBL Trustees approved a Year-Round Resource Center for Research. These recommendations came from the Long-Range Planning Committee established by Director James Ebert.

In 1974 the Decennial Committee endorsed increasing year-round science at the MBL. Five years later the Trustee Space Program Planning Committee approved recommendations by Director Gross expanded plans for year around activity. This led in 1980 for plans for a combined Marine Resources Center and Research Center.

In 1984 the Decennial Committee again recommended increasing year-round science at the MBL. In 1987 the MBL Trustees approved, in principle. Long-Range Goals,

including a new year-round research building (Fischbach Report). A year later (1988) the MBIAS (MRC and ASL, see below) was approved unanimously by Executive Committee and Trustees. In 1989 a Science Advisory Committee endorsed increasing year-round science, and a year later recommended more space for research.

By 1988 over 100 Corporation members and 23 external consultants have participated in developing these long-range plans. In the previous 20 years, at least 3 groups of Trustees have approved these plans. The Woods Hole community objected to the construction of one large building combining year-round research and the Marine Resource Center during the late 1980's. Members of the Community have participated in, and consented to, the plans for two main buildings in the MBIAS proposal.

Having served on the Executive Committee of the MBL in the 1970's and as a member of the Fishback Long-Range Goals Committee, I was aware of the past efforts to build the MRC when I accepted the position of President and Director of the MBL in 1987. Several events changed at this time, which improved the chances for MBL to fund this facility. These were (see below): the establishment of the Laboratory of Marine Animal Health at MBL, the establishment of the National Association of Marine Laboratories, focusing on marine animals as models for biomedical research, community support, and the approval of the MBL Trustees to support a request for federal funds to build the facility.

Marine Veterinary Medicine

By the 1970's concern began to develop that the extensive biological and biomedical research carried out in the Marine Biological Laboratory (MBL) and the Woods Hole Oceanographic Institution (WHOI), the National Marine Fisheries Service (NMFS) without the involvement with aquatic animal health by the veterinary profession in the United States. Woods Hole appeared to be the ideal spot for developing essential knowledge and expertise in the normative biology and diseases of the more than 200 species of marine vertebrates and invertebrates used as laboratory animals, food animals, and companion animals in the region.

On August 16, 1976 the University of Pennsylvania invited their colleagues from the College of Veterinary Medicine at Cornell University to join with them in creating an educational program to provide students an opportunity to adapt their veterinary skills to aquatic animals. The academic courses were defined by the two veterinary schools with advice from colleagues at the MBL, WHOI, and NMFS. The major players in this effort were: Drs. Robert R. Marshak, Donald A. Abt, and Leon P. Weiss, Penn's Dean, Associate Dean, and Chairman of the Department of Animal Biology; Edwin C. Melby, Jr. and Charles G. Rickard, the Dean and Associate Dean respectively at Cornell; James D. Ebert, Director of the MBL; WHOI's Robert W. Morse; and Robert Edwards of NMFS. A joint grant proposal to the New York Sea Grant Institute for support of a course coined *AQUAVET*® by Dr. Weiss.

From this collaborative effort, *AQUAVET* has grown to become recognized as the bench

mark veterinary academic program in aquatic animal medicine. A total of 602 students from around the world have participated in the introductory and advanced course offerings. To this day, the course continues to be presented at the MBL and representatives of the 5 founding institutions all continue to play major roles in the effort. Directorship of *AQUAVET* has been vested in Dr. Abt for the 20 years. Dr. Rickard served as Associate Director until his retirement following the 1985 course at which time Dr. Paul R. Bowser assumed that role on behalf of Cornell. Dr. Laurie J. Landeau, an alumnus of the 1981 *AQUAVET* I and 1983 *AQUAVET* II courses, joined Drs. Abt and Bowser in the administration of the courses in 1988 and continues at the present time as an Associate Director. (Data from Donald A. Abt, V.M.D in “Reflections on 20 Years of *AQUAVET*® 1977-1996”.)

The success of the educational program led to a proposal in October 1979 to provide veterinary medical services for experimental animals used at the MBL. Funding was sought from the Division of Research resources at NIH to support this activity. In July 1980 Drs. James Carlisle and Jan Spitsbergen began to provide diagnostic services to summer investigators. On June 15 1981 Dr. Louis Leibovitz, Cornell University veterinary Medical faculty, became the first Director of the Laboratory for Marine Animal Health (LMAH). Funding by the NIH on August 1, 1981 allowed LMAH to develop health maintenance and disease prevention strategies for the laboratory animals maintained by Marine Resources and investigators at the MBL. The LMAH grew to a full service veterinary diagnostic/research facility from which more than 40 new diseases of marine laboratory animals have been reported.

Formation of the National Association of Marine Laboratories (NAML)

Marine laboratories have been the traditional institutions in which the expertise in marine animals existed. This was recognized by instrumentation support by the Federal government. When this support was withdrawn in 1984, Dr. John Costlow, Director of the Duke University Marine Laboratory organized a meeting of marine lab directors to mobilize support to reinstate federal support. The following year a group of scientists from marine labs located along the southeast and Gulf Coasts met at the Gulf Coast Research Laboratory, Ocean Springs, MS to create the formation of the Southern Association of Marine Laboratories (SAML). Harold Howse was unanimously elected as SAML's first president.

It soon became apparent that a national organization of marine laboratories would be more effective in advocating federal policies. During an American Society of Limnology & Oceanography (ASLO) meeting in December 1988, at the Romberg Tiburon Center for Environmental Studies, San Francisco State University, Tiburon, CA, a group of approximately 70 marine lab directors and scientists, met in another attempt to establish the National Association of Marine Laboratories (NAML). Two major objectives were adopted for the organization: 1. It would act as a national body speaking in support of issues related to infrastructure and maintaining marine labs as a national resource and, 2. It would function as a forum and means for information exchange between marine lab directors where issues of common scope could be discussed and information shared.

In October 1989, the NAML steering committee met with marine lab directors attending the annual Estuarine Research Federation meeting in Baltimore, MD. The concept of NAML was accepted, and the initial officers elected. Dr. Harlyn Halvorson, Marine Biological Laboratory (MBL), Woods Hole, MA, became the first president of the National Association of Marine Laboratories or NAML, and Dr. James Clegg, Bodega Marine Laboratory, Bodega Bay, CA, President-elect. The first regular meeting of NAML was held during 2-3 November 1990 at the MBL. At an organization meeting on 10-11 May 1991, a steering committee was formed to draft articles and bylaws based on the SAML organization.

The second NAML Meeting, 12 October 1991, adopted Aims and Goals for NAML to advance the profession in marine science:

- To disseminate the information in marine science, to promote the application of marine science and to stimulate research and promote education in marine science,
- To further the wise use and conservation of marine and coastal resources, and
- To increase the effectiveness of member institutions in their work on marine and coastal resources.
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As described below NAML would play an active role in advocating for Marine Models in Biomedical Research.

Marine Models in Biomedical Research

In 1985 the National Institutes of Health (NIH) sponsored an evaluation by the National Academy of Science of modeling in biomedical research. The report of the evaluation, "Models for Biomedical Research: A new Perspective," recommended that NIH encourage interest in non-mammalian systems and develop such systems as biomedical research models.

In 1988 a Marine Life Resources workshop was held at the Duke University Marine Laboratory in Beaufort, North Carolina. The workshop was designed to help NIH's Division of Research Resources (DDR) develop and formulate plans for future support of marine life resources through its recently established Biological models and Materials Resource Section (see Table 1). The participants were largely representatives of marine laboratories that were later to form NAML. Later representatives of NAML testified before Congressional committees and conferred with and obtained the support of Institute Directors at NIH, including the Division of Research Resources (DRR). The result of these efforts was the approval in 1993 by both the Senate and the House for a \$10 M appropriation to DRR. The report language states "the Committee is pleased with the program developed by NCRR to generate marine models for use in biomedical research. Within the increase provided for NCRR, the Committee encourages the expansion of research to identify and use marine organisms as biomedical models." However these efforts were in vain as the Director of NIH refused to use these funds for this purpose.

In 1988 MBL received \$2.2 M for planning two research buildings, one behind Loeb and a second a marine resource facility on the Eel Pond. In the fall, president Reagan signed a bill authorizing funds for their construction. Harlyn Halvorson, President and director of the MBL, testified March 26, 1989 before the House Appropriations Subcommittee on Labor-Education-HHS. "For more than 100 years the MBL has been center stage in identifying and making available appropriate marine models for researchers throughout this country to study in the battle against disease, birth defects and other health problems that afflict mankind. Construction of the facilities authorized in PL 100-629 in 1988 are necessary to allow researchers at the MBL to carry out this research."

Town and Gown

Woods Hole is a small village of the town of Falmouth, which contains four major research institutions. As these intuitions overwhelm this small community, issues such as parking and building size and location, can be contentious. For example when Paul Gross proposed constructing a MRC building, he was opposed by a small group of residents of Woods Hole, several of which live on the Eel Pond. They objected to the size of the building and the fact that the building blocked their view of Water Street. Since very few members or employees have permanent homes in Woods Hole, one of my first actions as Director was to appoint these four individuals to serve as an Advisory Committee for the MRC. They would represent the MBL employees; play a key role in the exterior architecture of the building, as serve as communicators to the village and the town of Falmouth. The members of this committee were: George Caldwell, Mary Louise Montgomery, Thomas Renshaw, and Susie Steinbach.

Meetings with Woods Hole Advisory Committee started on November 22, 1988. This was followed early next year (January 17) with a presentation of building plans to Falmouth Town Planner, Building Commissioner and heads of departments of the Town of Falmouth government. A similar preview was given on March 16, 1989 to the Wood Hole Community Association. Later on May 22, meeting was held with the Falmouth and Woods Hole Advisory Committees to review any concern. Finally the design of the buildings was available in May and these were shown to the community advisory boards (May 27) and the Falmouth Selectmen (May 30). On July 7, a meeting was held with the Falmouth Historical Society to discuss the overall building plans. Finally an important second presentation of the MBIAS program was presented to the Woods Hole Community Association on July 18. The plans for the MRC were presented and discussed. As reported in the Enterprise, there was enthusiastic support for the proposed design.

Planning for the MBIAS Program and Seeking Federal Support

Building upon the Fishback report, as well as other previous studies, the new strategy was to create a Marine Biomedical Institute for Advanced Studies (MBIAS). This institute located at the MBL will enable us to: better understand the causes of neurological diseases, fertilization and development, growth of normal and abnormal cells, and train new generations of scientists in the use of marine organisms as models for study in biology. MBIAS would consist of a 40,000 square foot Advanced Studies Laboratory (ASL) and a 32,000 square foot Marine Resource Center (MRC).

The critical decision was to seek federal funds for MBIAS. MBL throughout its history has had close connections to the National Academy of Sciences (NAS). Many members of the MBL are members of the NAS and a number of previous MBL Directors have been officers of the NAS. By 1987 NAS had opposed the use of federal funds for construction projects that were not part of the appropriation process. Since there were no categories, nor study sections to deal with MBIAS like projects, I proposed to the Executive Committee and trustees that we request the NAS to appoint a peer-review committee to review the MBIAS proposal.

Drafting of MBIAS proposal began in April 1987. In June – August experts come to MBL for consultation. On June 27 plans began to develop for the MRC. In August through September the review process was underway including the NAS. On Aug. 29 the draft MBIAS proposal was submitted to the Exec. Committee for comment, and on August 14, the building plans were shared with the Trustees. Finally on Jan. 23, 1988 MBIAS (MRC and ASL) were approved unanimously by the Executive Committee and on February 20, 1988 the Trustees approved the long-range goals and endorsed seeking federal funds for MBIAS.

With this approval MBL secured the services of Ken Schlossberg, of Ken Schlossberg Consultants. Mr. Schlossberg, after training in international affairs, served as Staff Director of the senate Select Committee on Nutrition and Human Needs, and in 1976 worked with Dr. Jean Mayer to create a Human Nutrition Research Center and veterinary school for the New England Region. He assigned Ms. Mary Silvara of his staff to work with us. What follows is a chronology of the Federal Commitment for MBIAS.

Starting in 1988 the first objective in building support for funding MBIAS was to seek an endorsement of the project by the authorizing committees of the House and the Senate. An authorization indicates the project withstood expert congressional review and met important national objectives. In the effort to secure authorization, Senators Kennedy and Kerry were briefed, along with Congressmen Studds and Atkins. These members then presented the MBL proposal to the House and Senate committees that deal with biomedical research, as well as the committees responsible for setting national policy on marine biology issues,

I testified before the House Labor-HHS-Education appropriation's subcommittee to explain how MBIAS would benefit the nation and lay the groundwork for requesting funds once the authorization was secured. With the appropriations process for the year rapidly expiring and with final legislative clearance on the authorization assured but still a couple of weeks away, Congressman Conte agreed to intervene on MBL's behalf to Secure \$2.2 million in the bill funding the General Services Administration to allow design and engineering to begin. The President signed the bill and MBL began working with GSA to release some of the funds in a timely fashion.

In 1989 MBL worked to broaden the congressional coalition supporting MBIAS to obtain the support of the House and Senate appropriations committees for the full \$16+ million

estimated to complete the entire project. MBL Board members Hynes and Kendall share their knowledge and support for MBIAS with Senators Kennedy and Kerry. MBL began meeting with congressmen and senators from other states who sit on the appropriations committees to explain MBIAS. These MBL contacts include corporation members from Arizona and Maryland who have congressmen and senators on the committees.

Tim Shea, Republican staff director for the House appropriation subcommittee, visited the MBL. I testified before the House Labor-Health and Human Services appropriations subcommittee and submits testimony to the Senate. Finally \$2 million was appropriated to continue development and construction of the project. The President signed the bill.

In 1990 I visited Congressman Early, also a member of the House Treasury and Postal Appropriations Subcommittee, in Worcester with Thoru Pedersen and Dick Kendall. Following this I joined with various members of MAML to visit members of congress to talk about the importance of research being done at marine biology labs.

Senator Kerry toured MBL and agreed to be the Keynote speaker at the summer MBL Public Policy Symposium. Mike Nussman, Staff director of the Senate National Oceans Policy Committee, made a site visit. Finally, Congress approved \$4.75 million for construction of the first phase of MBIAS, the MRC, and the President signed the bill.

The next year, 1991, MBL begins construction of the MRC. MBL then began visits to congressional members and staff about funding to construct the ASL portion of the MBIAS. MBL presented testimony for the House and Senate Appropriations committees, and planed an event for congressional supporters keyed to construction of MRC.

Congressional supporters begin building case for another \$9.5 million over a two-year period to complete ASL and MBIAS. Funds were approved but only the MRC was constructed.

Construction of the MRC

The MRC Advisory Committee provided critical input to the Architect Edward T. M. Tsoi of Tsoi/Kobus & Associates. The members of this committee were:

- Dr. Robert Goldman, Northwestern Univ., Chairman
- Dr. Alan Kuzirian, MBL
- Dr. Donald Abt, MBL
- Dr. Rudolfo Llinas, N.Y.U. Medical Center
- Dr. Franklin Loew, Tufts University
- Dr. Robert Murchelano, NMFS
- Dr. Douglas Shanklin, University of Tennessee

The schematic design for the MRC was completed January 1990. Gilbane Building Company was selected as the contractor and construction started January 1991. Construction was completed and Full Occupancy issued on August 1992.

The new Marine Resources Center allowed MBL to serve the many scientists,

researchers, and students with a predictable supply of marine animals harvested from local waters or reared on site. The life support system is capable of providing raw seawater or recirculated seawater, heated or cooled to the required temperature. All of the seawater will be processed through several bio-filters before being returned to its source.

The ground floor of the new MRC building more than triples the former holding capacity of the MBL. The ground floor has facilities for isolated holding and a procedure room for examining large specimens.

In addition to holding facilities on the ground floor, the second floor provides space for controlled holding and long-term observation of specimens. A marine pathology program has offices, laboratories, and limited classroom space on this floor. There is a necropsy lab, as well as three supporting labs. A separate space is devoted to monitoring water quality within the MRC. Records are maintained on water temperature, pH, and other variables that are critical to long-term holding of marine animals.

The third floor of the MRC contains the equipment for the life support system and offices for the MRC staff. This mechanical area has been designed to be low-maintenance and highly reliable.

The MRC is constructed of concrete columns and slabs. The design integrates the building mass and scale into the existing MBL campus and historical Woods Hole context. The exterior is clad with granite stones, which match the existing Candle House building and provide solid protection from the harsh winds that blow off Great Harbor. The windows are wood with special non-corrosive hardware. Most of the interior partitions are honed-faced concrete block. These concrete blocks can withstand the constantly humid environment and rough treatment that this type of holding facility receives.

Dedication of the MRC

On June 19th the Sculpture by Elaine Cohen “The Scientist” is dedicated in front of the MRC. The next day the MRC was officially dedicated with Senators John Kerry and Edward Kennedy, and Representative Gerry Studds officiating and cutting the ribbon to the MRC building. At a lunch that followed the speaker was Dr. Jay Moskowitz, Associate director for Science Policy and Legislation, Office of the Director, NIH.

Prospects for the Future

Marine animals remain valuable models for biomedical research, sources for bioactive materials, and together with marine plants, sources for feeding the world’s population. In recent years numerous reports have called attention to the value of marine animals. Among these were the 2002 U.S. Commission on Ocean Policy and the 2003 Pew Report on Aquaculture in the United States.

Knowledge about marine animal and plants are traditionally focused in marine

laboratories. Because of the high costs involved in maintaining high standards required for the maintenance and propagation of animal species, as well as protecting the environment, few marine laboratories have been able to construct Marine Resource Centers. As the case history of the MBL shows, such facilities must serve a regional function to satisfy public support. In return for such support they have a responsibility to serve the public. Organizations such as NAML, and professional biological societies, have and should continue to alert the public about opportunities and needs to study marine animals. As public awareness of Ocean Sciences and Human Health increases, I expect that public and private support for research on marine animals will be forthcoming.

Acknowledgements

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TABLE 1
Some facilities supplying aquatic organisms to researchers

Site	Facilities
Battelle Marine Science Laboratory, Sequim, WA	Culture of bivalve ,mollusks and salmonid fish for biomedical research and environmental testing
California Institute of Technology, Pasadena, CA	Sea urchin culture, development of inbred and transgenic animals
Friday Harbor Laboratories, University of Washington, Friday Harbor, WA	Maintenance of diverse marine organisms using high-quality seawater
Hopkins Marine Station, Stanford University, Pacific Grove, CA	Culture of the tunicate <i>Botryllus</i> . Maintenance of many diverse marine organisms
Marine and Freshwater Biomedical Center, Duke University Marine Laboratory, Beaufort, NC	Sea urchins, <i>Limulus</i> , and diverse organisms supplied. Octopus and other marine organisms maintained for marine research
Marine and Freshwater Biomedical Center, Oregon State University, Corvallis, OR	Complete rainbow trout hatchery and cancer laboratory
Marine and Freshwater Biomedical Center, University of Wisconsin, Milwaukee. WI	Facility patterned after mammalian quarters to hold and use diverse aquatic organisms for biomedical research
Marine Biological Laboratory. Woods Hole, MA	Maintenance of diverse marine organisms with different environmental requirements
Marine Biomedical Institute, University of Texas, Galveston. TX	Squid and octopus mariculture in recirculating artificial seawater
Mote Marine Laboratory, Sarasota, FL	Maintenance of diverse marine organisms. Culture of clearnose skates
Mt. Desert Island Biological Laboratory, Salisbury Cove, ME	Collection and maintenance of sharks and skates in seawater
New England Aquarium, Boston, MA	Lobster culture, including all stages of development
University of Maine, Orono, ME	Culture of fanworm, <i>Myxicola</i>
The Whitney Laboratory, University of Florida, St Augustine, FL	Various marine species maintained in high-quality seawater, controlled temperature and light
Woods Hole Oceanographic Institution, Woods Hole, MA	Marine culture center for diverse organisms using high-quality seawater

From Marine Models in Biomedical Research Biol. Bull. 176, 37-348 (1988).